R&S®RTM
Digital Oscilloscope
Scope of the art

ROHDE&SCHWARZ

Test & Measurment

Product Brochure | 03.00

R&S®RTM Digital Oscilloscope

At a glance

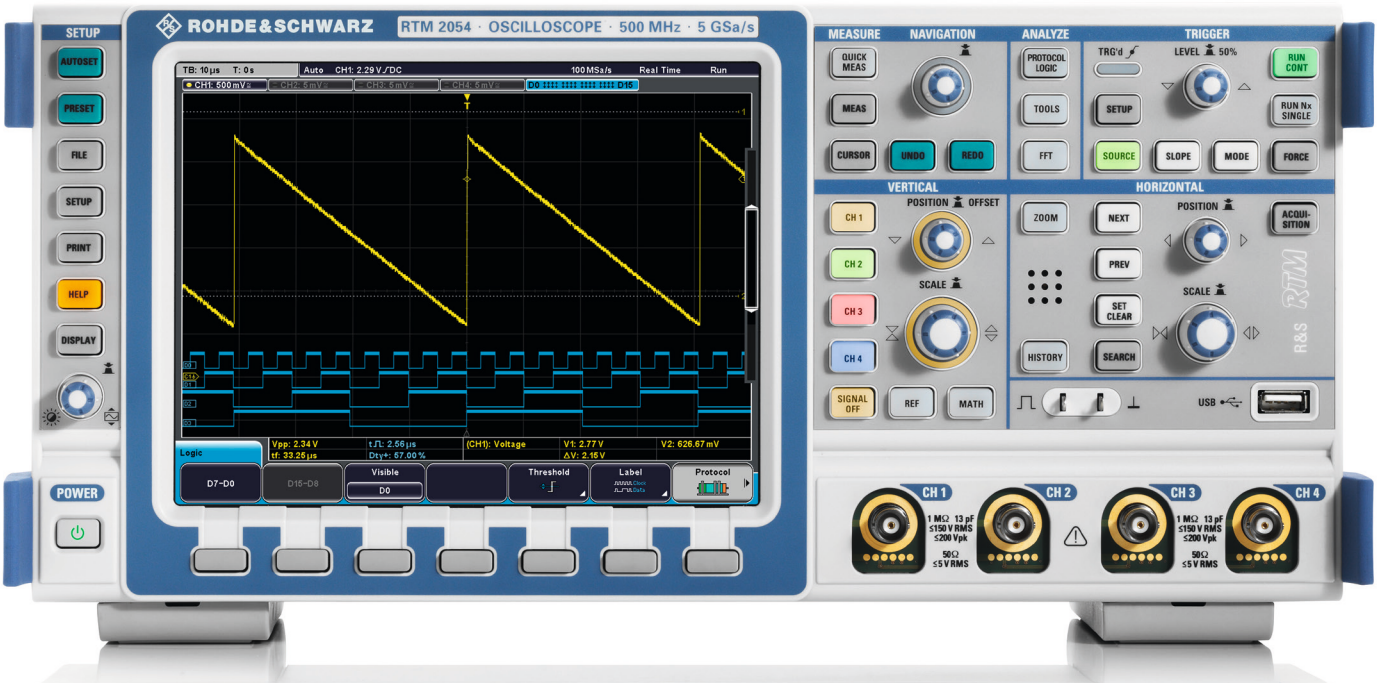
Ease of use, combined with fast and reliable results, is precisely what users get with the R&S®RTM bench oscilloscope. While other oscilloscopes are still booting up, the R&S®RTM is already displaying signals that would otherwise be lost in the noise and evaluating results. All on one screen with two displays, with lightning fast functions.

The R&S®RTM models with 350 MHz or 500 MHz bandwidth offer a maximum sampling rate of 5 Gsample/s and a maximum memory depth of 20 Msample. As a result, they can display signals accurately, right down to the details, as well as provide high time resolution, even for long sequences.

Besides the common measurement and analysis tools, R&S®RTM oscilloscopes have special features that help users to achieve the desired results quickly during debugging and signal analysis. At the push of a button, the QuickMeas function graphically displays the key measurement values for the signal that is currently active and updates them continuously. Functions such as mask tests and video triggers are supplied as standard with the R&S®RTM.

As a true scope of the art, the R&S®RTM meets the increased demands on bench oscilloscopes for the development, production and servicing of embedded hardware, providing time, frequency, protocol and logic analysis in a single box:

- Time analysis: high sensitivity of 1 mV/div to detect signals that would otherwise be lost in the noise
- Frequency analysis: fast, reliable fault detection in the signal spectrum with integrated FFT
- Logic analysis: 20 Msample with 5 Gsample/s for detailed analysis of digital signals
- Protocol analysis: simple triggering and decoding of serial buses



R&S®RTM Digital Oscilloscope

Benefits and key features

Result-oriented: fast and precise

- Fast time to results: switch on, measure and done
- Signal details at the push of a button: QuickMeas
- Settings in seconds: mask test
- Focus on details: search and navigation
- Integrated: FFT analysis

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Accurate: our strength

- 1 mV/Div: full measurement bandwidth
- Frontends: low noise and low crosstalk
- Deep memory: long sequences at high resolutions
- To the point: comprehensive triggering capabilities

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Usability: smart concepts

- Easy orientation: color-coded controls
- Two displays instead of one: VirtualScreen
- Error-tolerant: undo/redo function
- Remote control, data exchange: diverse interfaces
- Multilingual: choice of nine languages

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Extensible: more application power

- Logic analysis: fast and precise testing of embedded designs
- Serial protocols: easy triggering and decoding
- Segmented memory: long signal sequences for more details
- Power analysis: current and voltage in detail

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Probes: excellent contacting

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Accessories: for rack installation and transport

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Models

Base unit	Bandwidth	Channels		Max. sampling rate	Max. acquisition memory	Mixed signal option (MSO; with R&S®RTM-B1 option)
		analog	digital (with R&S®RTM-B1)			
R&S®RTM2032	350 MHz	2	16	5 Gsample/s	20 Msample	400 MHz, 5 Gsample/s (max.), 20 Msample (max.)
R&S®RTM2034		4				
R&S®RTM2052	500 MHz	2				
R&S®RTM2054		4				

Result-oriented: fast and precise

R&S®RTM oscilloscopes provide a decisive edge when performing everyday measurement tasks, delivering more comprehensive results, faster. Measurement tools such as QuickMeas, mask test and math functions are supplied as standard.

Fast time to results: switch on, measure and done

Optimized for fast results, the R&S®RTM starts up within only a few seconds. The most important measurement results for an active signal can be obtained at the push of a button (QuickMeas function), enabling fast signal characterization.

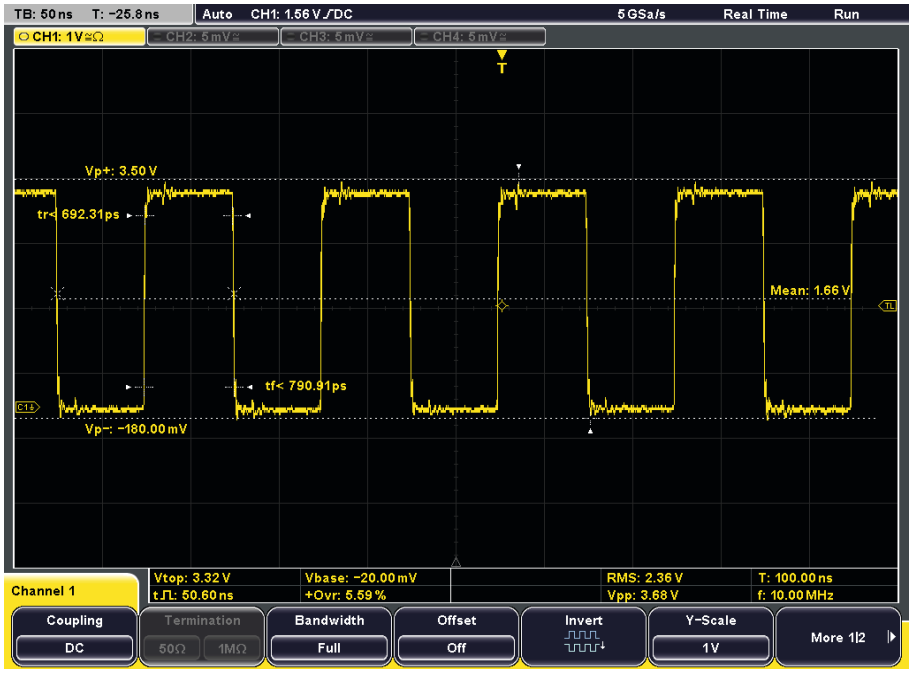
Signal details at the push of a button: QuickMeas

The QuickMeas function offered by the R&S®RTM oscilloscopes is unique. At the push of a button, it displays the key measurement values for a currently active signal (see table). The signal is also graphically displayed with continuously updated auxiliary lines and markers.

In addition to the QuickMeas results, the oscilloscopes also provide customary automatic measurement functions such as measurement of peak-to-peak voltage and signal frequency. The results are presented in tabular form, with statistical evaluation if desired.

QuickMeas: key results at the push of a button

Measurement value		Display
Vp_+	positive peak voltage	graphic display directly on the waveform
Vp_-	negative peak voltage	
tr	rise time	
tf	fall time	
Mean	mean voltage	
V_{pp}	peak-to-peak voltage	tabular display on the bottom right of the screen
RMS	RMS value	
T	time	
f	frequency	



QuickMeas: automatic measurement and graphical display at the push of a button.

Measurement results in detail: cursor functions

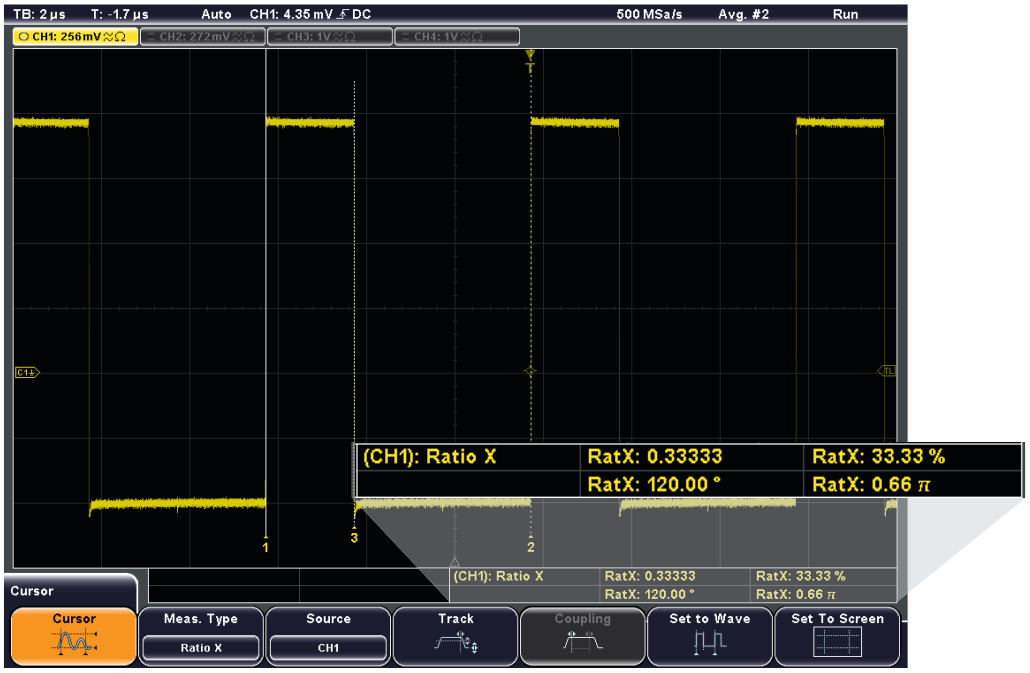
The R&S®RTM offers additional functions beyond the standard horizontal and vertical cursor measurements. Users can easily apply measurements such as mean voltage, RMS value and a pulse counter to a specific section of the signal. At the push of a button, the "Set to Wave" function automatically assigns the cursors to the corresponding signals, eliminating the need for manual positioning.

Settings in seconds: mask test

Mask tests quickly reveal whether a specific signal lies within defined tolerance limits and use statistical pass/fail evaluation to assess the quality and stability of a device under test. Signal anomalies and unexpected results are easy to identify by stopping the measurement if the mask is violated.

The mask test function is a standard feature in R&S®RTM oscilloscopes. It is easy to use and can be flexibly configured. A new mask can be created from a reference signal with just a few keystrokes. Existing masks can be loaded from the internal memory or from a USB flash drive. If an active mask is violated, various actions can be taken to ensure the optimum response.

Mask test functions	
Evaluation	total number of acquired waveforms
	number of successful and faulty sweeps (absolute/percentage)
	total test duration
Actions	acoustic signal
	stop acquisition
	screenshot
	print
	save waveform
	output pulse



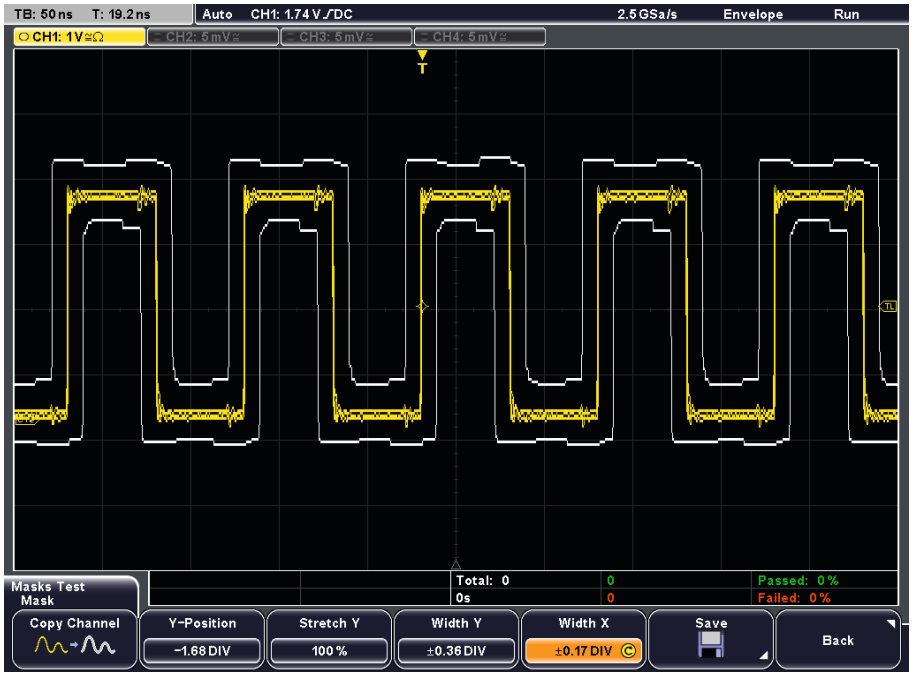
Special cursor measurement: using three cursors to determine the duty cycle of a pulsed signal.

Focus on details: search and navigation

The sampling rate of up to 5 Gsample/s enables R&S®RTM oscilloscopes to achieve a high time resolution. The memory depth of up to 20 Msample makes it possible to acquire long signal sequences, e.g. 4 ms at a sampling rate of 5 Gsample/s.

The search and navigation function helps users to manage even long records, enabling them to detect and mark events within seconds. Users can search for simple signal characteristics such as edge and pulse width, complex bit sequences and decoded serial buses. A table lists the matching events and can be used to navigate from one event to another. Separate from the search function, users can set eight event markers on the signal and easily navigate through them using the Next and Prev buttons on the R&S®RTM oscilloscopes. For detailed analysis, the zoom function can be used to enlarge the signal up to 200 000:1.

Search and navigation	
Types	edge
	pulse width
	peak
	rise time
	fall time
	runt
	clock data
	pattern
	protocol contents
Display	diagram, table
Markers	up to 32
Navigation	marker quick select button
	rotary knob in table



Mask test: mask definition from a reference signal.

Integrated: FFT analysis

The FFT function has a dedicated button and enables users to detect and analyze faults within a signal's spectrum. R&S®RTM oscilloscopes simultaneously provide a spectral display of the signal and a time domain window for checking the sampling interval. The Autoset button is extremely convenient: when it is pressed, the instrument automatically selects the amplitude and frequency scaling that optimally matches the measured signal.

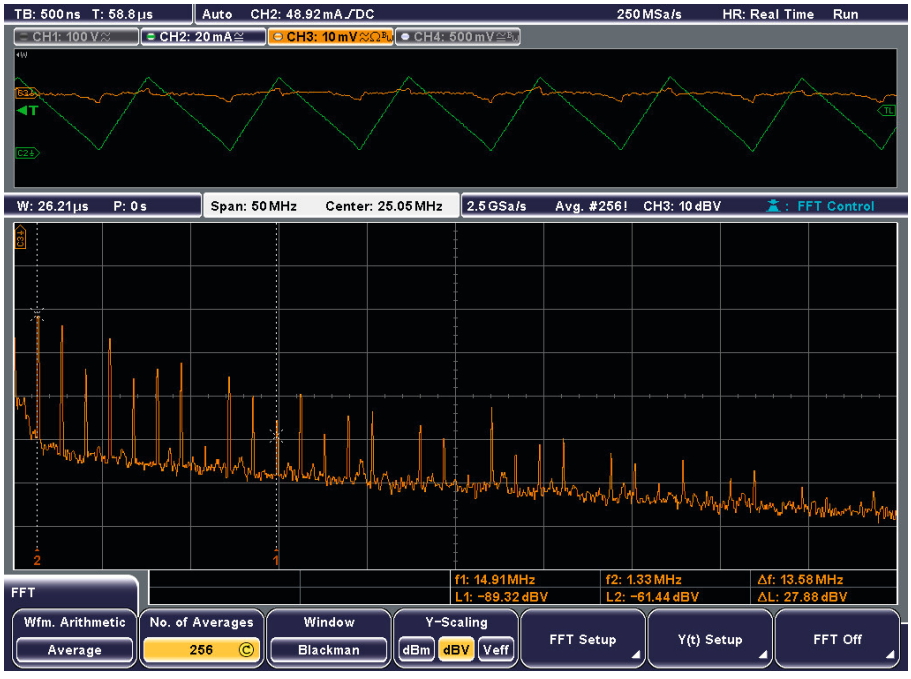
More than a calculator: math functions

Math functions tailored to everyday problems help solve measurement problems quickly. For example, with just a few keystrokes users can square the waveform and divide it by resistance in order to display power over time. In addition to basic math functions, advanced functions such as derivatives and digital filters are available. The results can also be used as arguments for other mathematic functions.

Easy comparisons: four reference waveforms

When analyzing faults, it is useful to compare the waveforms with a reference. The R&S®RTM provides up to four reference waveforms that can be generated at the press of a button. The waveforms can be scaled, stored internally or externally and reloaded.

Math functions	
Functions	+, –, *, /
	max./min.
	square (^{2}), square root ($\sqrt{}$)
	absolute value
	pos./neg. waveform
	inversion
	reciprocal
	log10, ln
	derivation, integration
	cycle, frequency
	pos./neg. duty cycle
	pos./neg. pulse width
Digital filters	lowpass/highpass



FFT analysis: fast identification of harmonics in the output voltage of a DC/DC converter.

Accurate: our strength

Rohde&Schwarz has many years of experience developing precision test and measurement equipment and has brought this expertise to bear in the R&S®RTM oscilloscopes. Users benefit from top accuracy and excellent analysis capabilities thanks to deep memory and a powerful trigger system.

1 mV/Div: full measurement bandwidth

With their input sensitivity of up to 1 mV/div, R&S®RTM oscilloscopes offer high vertical resolution. Other oscilloscopes attain such high input sensitivity only by employing software-based zooming or by limiting the bandwidth. The R&S®RTM shows a signal's real sampling points over the full measurement bandwidth, even at 1 mV/div. This high measurement accuracy is particularly beneficial when measuring small signal amplitudes.

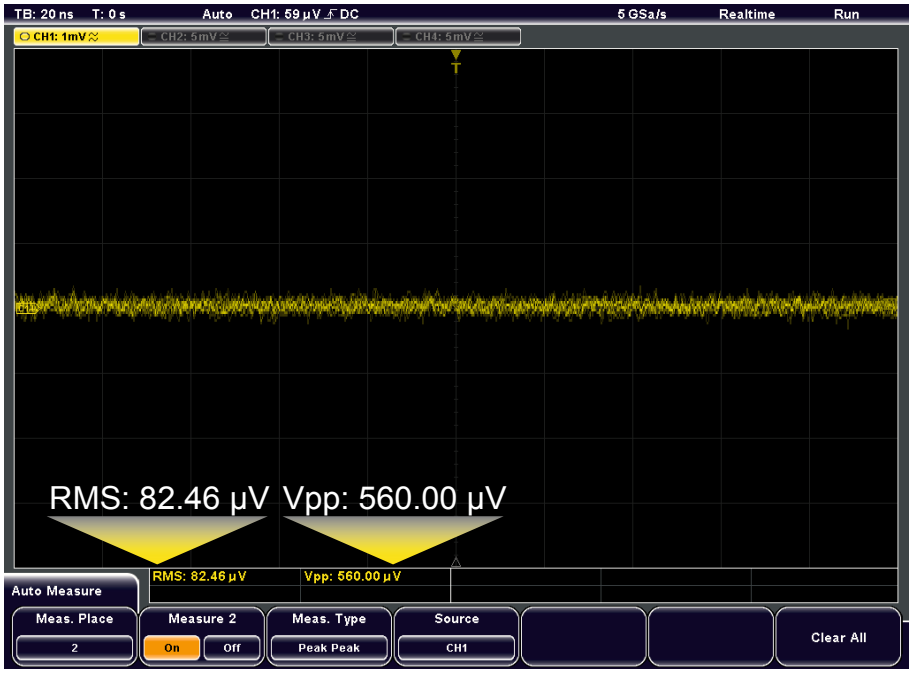
Frontends: low noise and low crosstalk

The accuracy of a signal displayed on the screen greatly depends on the oscilloscope's inherent noise. R&S®RTM oscilloscopes have low-noise frontends and A/D converters, enabling them to measure precisely, even at the smallest vertical resolutions.

This precision is retained even when additional channels are used. The R&S®RTM has an excellent channel-to-channel isolation of > 50 dB up to 500 MHz, which ensures that the signal from one channel has the lowest possible influence on signals from the other channels.

Acquisition cycle as a function of sampling rate and memory depth

	10 ksample	1 Msample	10 Msample	20 Msample
5 Gsample/s	2 µs	200 µs	2000 µs	4000 µs
2.5 Gsample/s	4 µs	400 µs	4000 µs	8000 µs



Extremely low inherent noise, even for a vertical input sensitivity of 1 mV/div.

Deep memory: long sequences at high resolutions

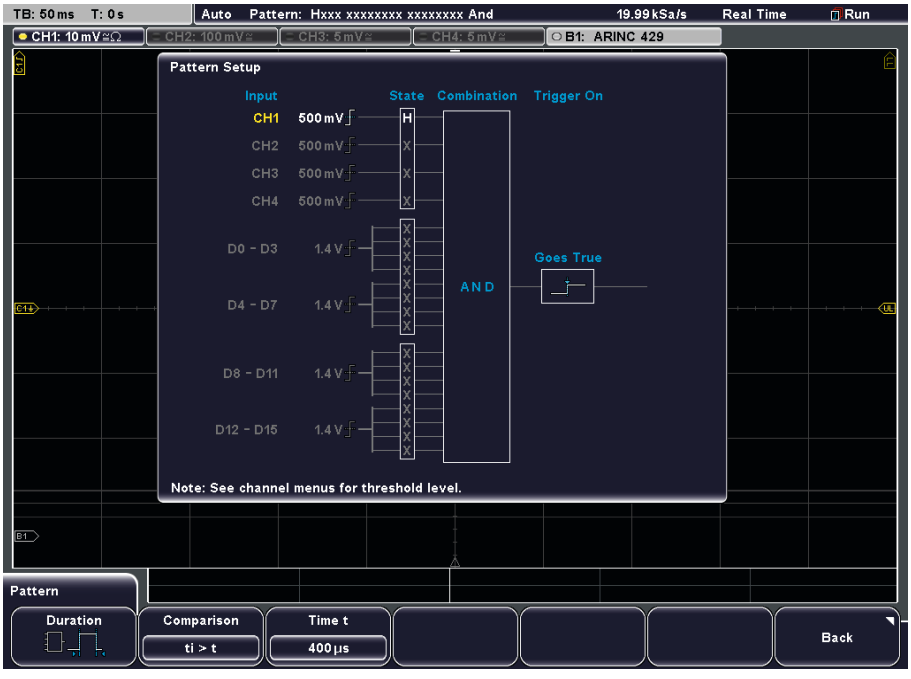
The more details an oscilloscope can show, the higher the probability of detecting signal faults and important events. The oscilloscope must have a high time resolution, i.e. a high sampling rate. In addition, many applications require long acquisition cycles, for instance for analyzing transients or serial protocols. R&S®RTM oscilloscopes boast impressive features, with a deep memory of 20 Msample at a time resolution of up to 200 ps (5 Gsample/s sampling rate). When combined with the R&S®RTM-K15 history and segmented memory option, the memory is expanded to 460 Msample.

To the point: comprehensive triggering capabilities

Precise triggering ensures a stable signal display on the screen and fast isolation of signal events of interest. R&S®RTM oscilloscopes offer many standard trigger capabilities, including pulse width, runt and video triggers. Capabilities include complex trigger conditions with logical linking of analog and digital channels. Serial protocol triggers are optionally available.

Dedicated buttons allow fast switching between the Auto and Normal trigger as well as selection of the trigger edge and source. The rotary knob for trigger level offers additional operating convenience: a single press sets the trigger level to 50 % of the signal amplitude.

Trigger types	
Edge	rising, falling, both
	LF, RF suppression, lowpass
	hysteresis: automatic, small, medium, large
Pulse	time: >, <, =, ≠
	interval: inside, outside
	polarity: positive, negative
Rise time	polarity: rising, falling, both
	level: upper, lower
	time: >, <, =, ≠
Runt	level: upper, lower
	polarity: positive, negative
Video	PAL, PAL-M, NTSC, SECAM, SDTV 576i, HDTV 720p, HDTV 1080p, HDTV 1080i
	signal: positive, negative
	lines
	frames: odd, even, all
Logic	pattern over analog and digital channels
	duration: >, <, =, ≠
	interval: inside, outside, timeout
Protocol (optional)	content
	error
B trigger	edge



Complex sequences are found quickly using the pattern trigger.

Usability: smart concepts

R&S®RTM oscilloscopes are easy and intuitive to use. They make user wishes come true: just unpack the instrument, switch it on and start measuring.

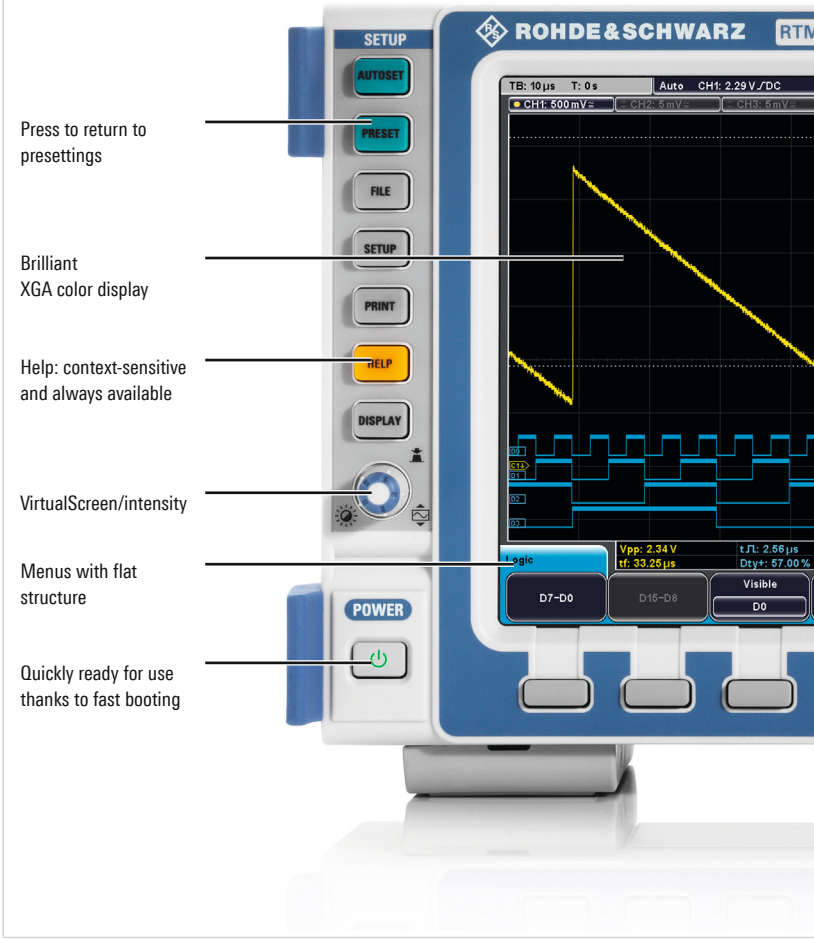
Easy orientation: color-coded controls

The controls for vertical settings and the trigger are color-coded. Multicolor LEDs around the rotary knobs visualize the channel that is currently in focus. The color coding corresponds to the signal display on the screen. This clear mapping allows smooth work, even during complex tests and measurements.

Fast access: flat menus

The logically grouped menus with flat structures provide a fast overview of instrument settings. Dedicated keys are provided for the most frequently used functions. Numerous setups such as the logic trigger are supported by graphics.

Controls on the R&S®RTM oscilloscopes



Error-tolerant: undo/redo function

Restoring previous settings is no problem with the undo/redo function. This makes it easy to correct mistakes such as pressing the wrong key.

See more: high-resolution XGA display

The high-resolution 8.4" color XGA TFT display is one of the highlights of the R&S®RTM oscilloscopes. This brilliant, sharp display clearly shows the measurement signals, right down to the smallest details.

Two displays instead of one: VirtualScreen

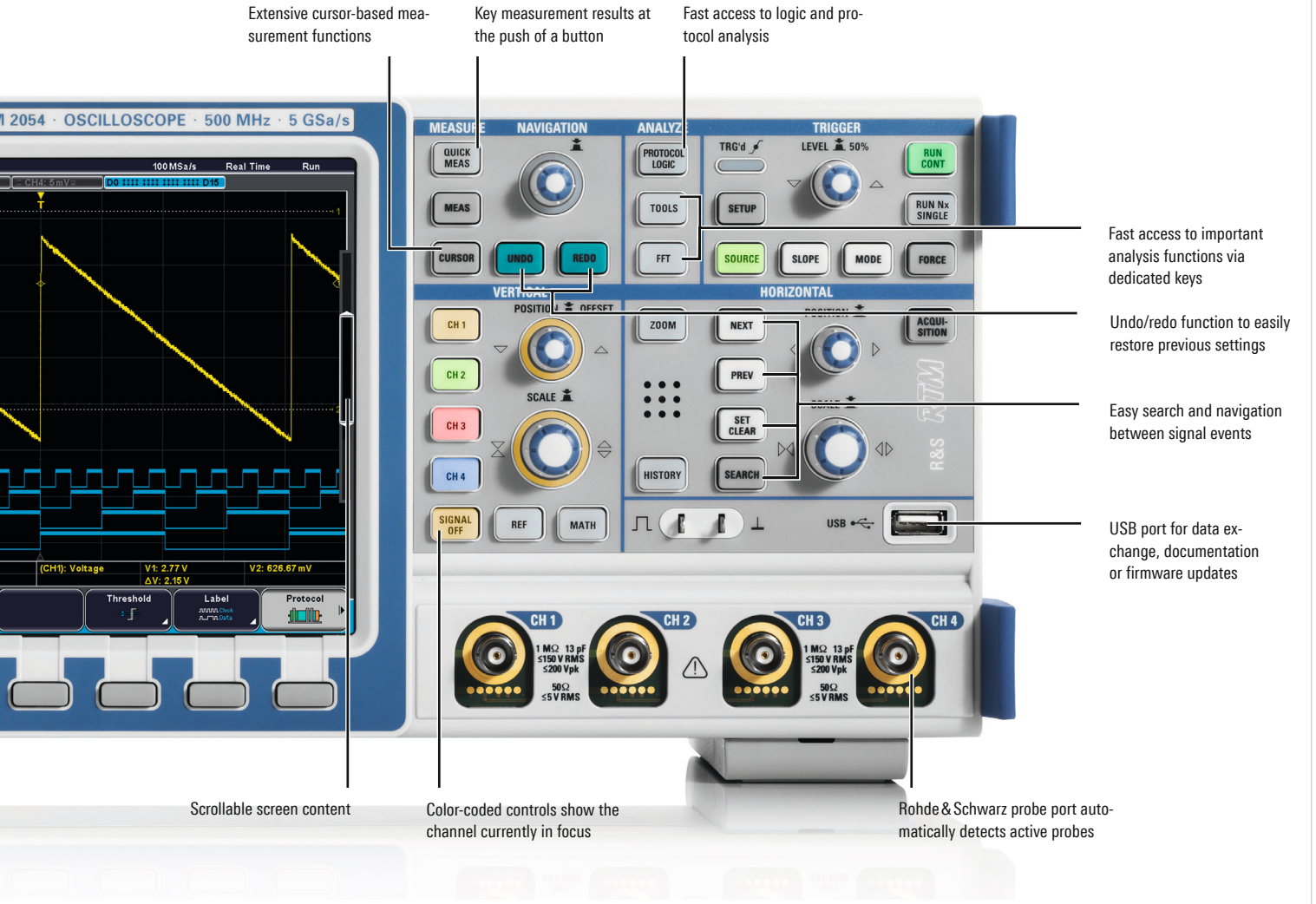
The R&S®RTM oscilloscopes' VirtualScreen supports simultaneous display of analog and logic signals. The screen can be expanded to 20 divisions for straightforward display of all signals. The visible section of the VirtualScreen is moved to the desired position using a rotary knob, facilitating detailed signal analysis without sacrificing the big picture.

Remote control, data exchange: diverse interfaces

Three USB interfaces are available on R&S®RTM oscilloscopes: two USB host ports that can, for example, be used to transfer screenshots or instrument settings to a USB flash drive, and one USB device port to remote control the oscilloscopes. The LAN interface for remote control or for accessing the instrument via a web browser comes as standard. Using the web interface, screenshots and data can be saved directly to a PC. Simple SCPI commands can be quickly issued. A GPIB interface is available as an option. The DVI output controls a monitor or a data projector.

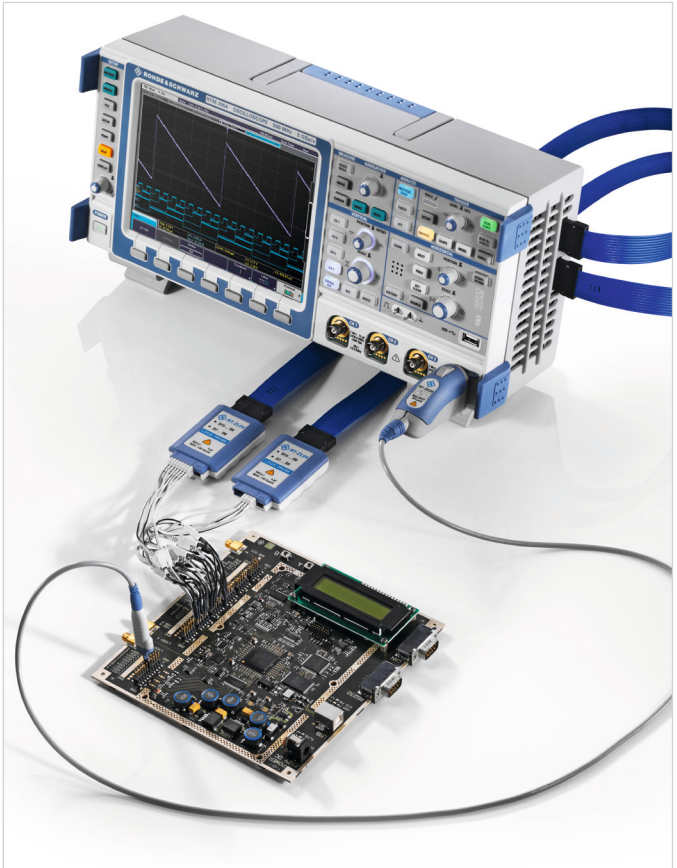
Multilingual: choice of nine languages

R&S®RTM oscilloscopes are fluent in different languages. Users can choose from German, English, French, Spanish, Russian, simplified and traditional Chinese, Korean and Japanese.



Extensible: more application power

Investments in test and measurement equipment are subject to one all-important rule: the equipment must be capable of growing with user requirements. Rohde&Schwarz has optimized the R&S®RTM to meet this demand.



R&S®RTM oscilloscopes: prepared for logic analysis. Installation is a simple on-site process without shipping back the instrument.

Availability without interruption: adaptable hardware

With R&S®RTM oscilloscopes, there is no need to return instruments for upgrades. Hardware options can be enabled with a keycode (e.g. logic analysis) or simply installed on site (e.g. GPIB interface), yielding the following benefits:

- Quick and easy installation of new options
- Instrument immediately ready for continued use
- No additional installation costs
- No additional expense for alignment or recalibration after installation of options

Adaptable: software options on demand

The base unit includes the complete functionality of an advanced oscilloscope but is extensible in steps. For example, analysis options are available for serial buses and power electronics. The R&S®RTM keeps pace with the challenges that are sure to arise in any company.

Simple and free of charge: firmware updates

The instrument firmware is updated using a USB storage device. Free updates can be downloaded from the Internet at www.rohde-schwarz.com.

Higher bandwidth: upgrade including calibration

All 350 MHz R&S®RTM oscilloscopes can be upgraded to a bandwidth of 500 MHz. The upgrade option includes complete testing and calibration of the instrument by Rohde&Schwarz at one of its service centers.

Secure erase

The secure erase function protects sensitive data. This central function removes all user data and settings, including device setups and reference waveforms.

Options		
Bandwidth upgrade		R&S®RTM-B200
Logic analysis (MSO)		R&S®RTM-B1
GPIB interface		R&S®RTM-B10
Serial triggering and decoding	I²C/SPI	R&S®RTM-K1
	UART/RS-232/ RS-422/RS-485	R&S®RTM-K2
	CAN/LIN	R&S®RTM-K3
	I²S/LJ/RJ/TDM	R&S®RTM-K5
	MIL-STD-1553	R&S®RTM-K6
	ARINC 429	R&S®RTM-K7
History and segmented memory		R&S®RTM-K15
Power analysis		R&S®RTM-K31

Logic analysis: fast and precise testing of embedded designs

The R&S®RTM-B1 option turns the R&S®RTM into an easy-to-use mixed signal oscilloscope (MSO) with 16 digital channels.

Logic analysis features	
Channels	16 divided over two logic probes
Acquisition memory	10 Msample with two logic probes; 20 Msample with one logic probe
Sampling rate	2.5 Gsample/s with two logic probes; 5 Gsample with one logic probe
Input impedance	100 kΩ ± 2 % || ≈ 4 pF (meas.) at the probe tip
Max. input frequency	400 MHz (meas.)
Max. input voltage	±40 V (U_s)
Min. input signal deviation	500 mV (U_{ss}) (meas.)

Precision measurement: up to 5 Gsample/s sampling rate

The R&S®RTM oscilloscopes' sampling rate of up to 5 Gsample/s makes it possible to accurately measure the timing of logic signals. Since the signals can be precisely time-referenced to one another, timing and clock errors can be detected with greater ease, e.g. on serial or parallel bus signals. R&S®RTM oscilloscopes use the high sampling rate over the entire acquisition time, ensuring high time resolution even for long acquisition cycles.

Deep memory: acquire long signal sequences

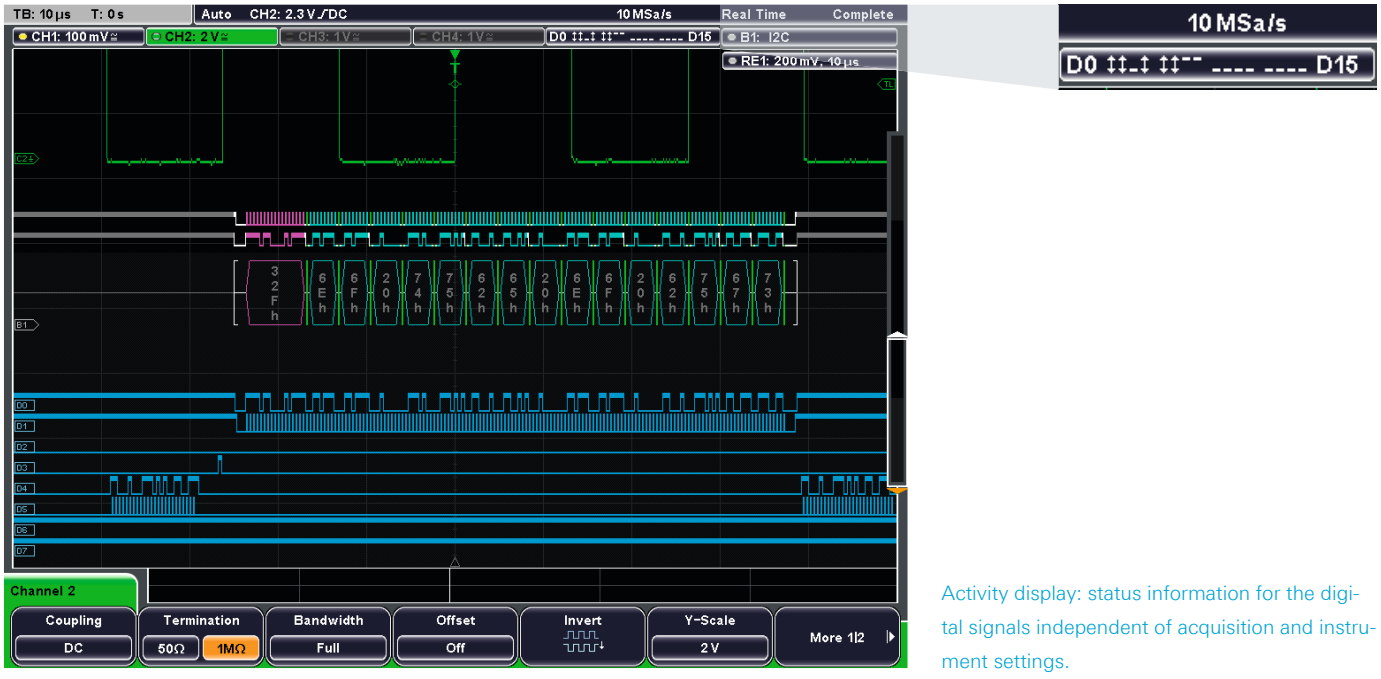
Logic signals are stored in the R&S®RTM with up to 20 Msample, or even up to 460 Msample when combined with the R&S®RTM-K15 option. This long acquisition cycle in combination with the high sampling rate makes it easy to detect timing errors even far from the trigger point. The different memory depths for the digital and analog channels eliminate the need to restrict the acquisition cycle for digital channels.

Better overview: VirtualScreen

Superimposed displays of logic and analog signals are hard to read and make analysis more difficult. The VirtualScreen of the R&S®RTM oscilloscopes uses a different approach. It doubles the usable screen area for clear display of the channels with no overlapping. Math, reference and logic signals can be displayed above or below the analog channels.

Everything at a glance: activity display

The R&S®RTM oscilloscopes' activity display provides a clear overview of the current status of all logic channels (high, low, toggle), regardless of the trigger settings. Users can see the status of all logic signals at a glance.



Activity display: status information for the digital signals independent of acquisition and instrument settings.

Serial protocols: easy triggering and decoding

R&S®RTM oscilloscopes support triggering and decoding of serial interface protocols. In combination with powerful analysis functions, they are an excellent tool for verifying and debugging embedded designs.

Tools for protocol analysis: triggering and decoding options

Serial bus signals include control, address and clock information in addition to the user data. Consequently, additional software support is typically required for debugging systems that use serial data buses. Isolating protocol-specific events becomes easier if the oscilloscope can trigger on the content of the serial protocol that is being used and display the decoded message.

The R&S®RTM provides versatile tools for protocol-specific triggering and decoding of serial interfaces. Extensive trigger capabilities help acquire relevant events. Because decoding is hardware based, the R&S®RTM enables smooth operation while quickly isolating faults.

Options for triggering and decoding

Application	Serial standard	Option
Embedded	I²C/SPI	R&S®RTM-K1
	UART/RS-232/RS-422/RS-485	R&S®RTM-K2
Automotive	CAN/LIN	R&S®RTM-K3
Audio	I²S/LJ/RJ/TDM	R&S®RTM-K5
Aerospace and defense	MIL-STD-1553	R&S®RTM-K6
	ARINC 429	R&S®RTM-K7

Decoded hexadecimal I²C message.

Everything at a glance: clear display

Decoded protocols can be displayed in all conventional formats, including hex and ASCII. The different sections of the message (address, data, start, etc.) are color-coded to make analysis easier. Label lists can be loaded to simplify and speed up interpretation. IDs and addresses in the data stream are designated with easily understood aliases such as "Engine Speed" instead of in hex format. A tabular listing of the decoded data is provided in addition to the usual honeycomb diagram.

Complete communications instead of snippets: deep memory

The deep memory of the R&S®RTM makes it possible to acquire meaningful communications segments and helps users quickly understand the DUT behavior in context. The detailed display of the decoding is adjusted automatically depending on the zoom factor. The decoded data can also be displayed in tabular form, keeping everything clear.

Intuitive: search and navigation

The different tools for protocol analysis are tightly integrated. The search function can be used to quickly find protocol-specific content segments, making navigation between segments possible. For example, when a row in the decoding table is selected, the corresponding data is also highlighted on the displayed waveform.

Multiple protocols in parallel: not a problem

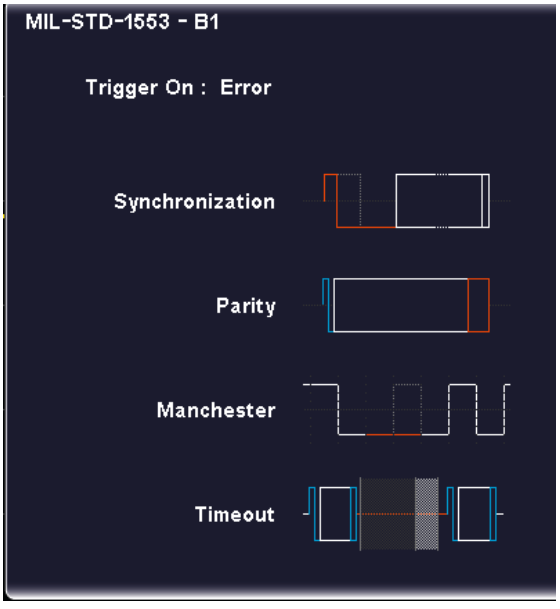
Errors often result from the interaction of multiple influencing factors. The R&S®RTM decodes and displays up to four buses in parallel, making it possible to immediately identify unwanted interactions. The R&S®RTM VirtualScreen provides a clear overview at all times.

Highlights of serial protocol analysis

- Hardware-based decoding for finding errors fast
- Direct triggering on protocol contents and error states
- Simultaneous decoding and display of up to four protocols
- Deep memory of up to 460 Msample (R&S®RTM-K15)

Displays	color-coded message
	table
Format	ASCII
	binary
	octal
	decimal
	hexadecimal

- Powerful search and navigation over the entire memory
- Easy configuration using adaptive wizards



Communicative popup windows: intuitive display of setting options for error states in the MIL-STD-1553 protocol.

Segmented memory: long signal sequences for more details

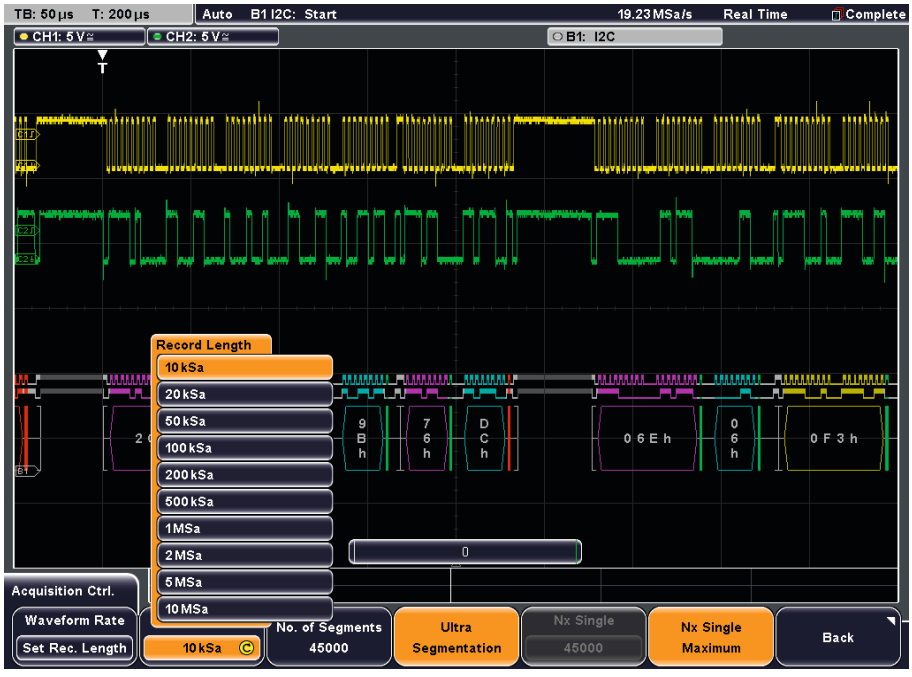
The R&S®RTM-K15 history and segmented memory option acquires and analyzes pulse and burst signals over a long observation period. At 460 Msample, the deep, segmented acquisition memory is an absolute innovation in this class.

Long acquisition cycles with 460 Msample memory

The deep, segmented memory provided by the R&S®RTM-K15 option can be used for analyzing signal sequences over a long observation period with no signal-free gaps. For example, protocol-based signals such as I²C or SPI in embedded designs can be acquired over several seconds or minutes. Thanks to the variable segment size from 10 ksample to up to 20 Msample, the 460 Msample memory is optimally utilized; up to 45 000 cohesive individual recordings are possible.

This feature will be appreciated by physics researchers who are monitoring pulsed lasers as well as developers of pulsed radar systems. When combined with the mixed signal option or serial bus analysis options, the R&S®RTM-K15 option is ideal for debugging embedded designs.

Highlights
460 Msample segmented acquisition memory
Acquisition of up to 45 000 individual segments
Short blind time: < 5 µs
Acquisition of both analog and digital signals as well as serial bus protocols in the segmented memory
Access to all analysis tools (e.g. mask test or QuickMeas)
Exact timestamp for all acquisitions



Easy selection of segment length.

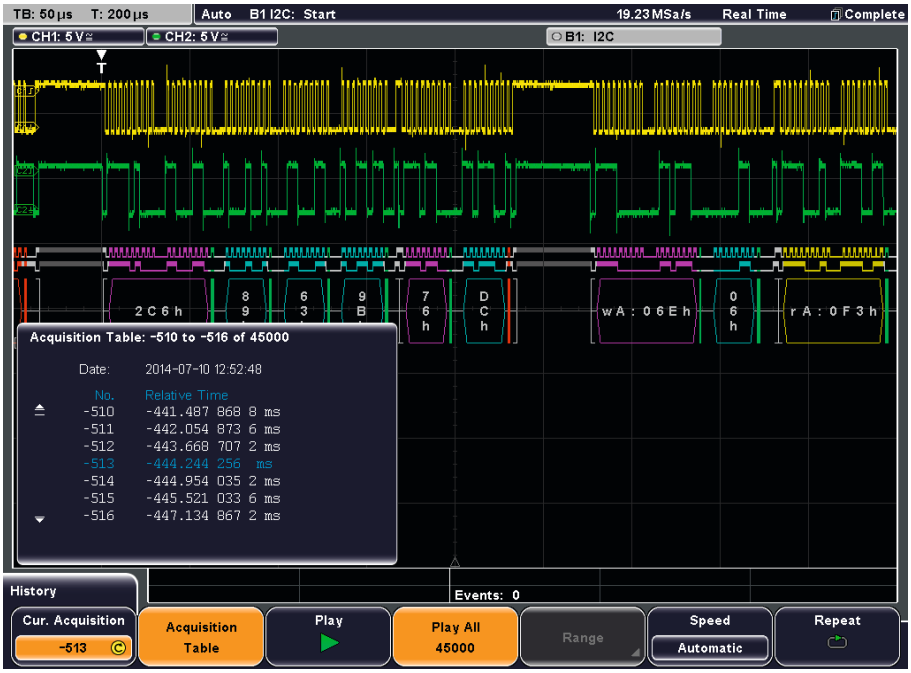
Apply all oscilloscope functions to past events

By pressing the History key, all previous acquisitions up to the maximum segmented memory depth of 460 Msample are available for further analysis.

All analysis tools are available in history mode, including mask test, QuickMeas function and FFT analysis. The history function can also be used with the digital channels of the MSO option, and be combined with all serial bus analysis options.

No detail missed thanks to minimum blind time

In the ultra segmented mode, the minimum blind time is less than 5 µs. Serial protocol and pulse sequences can be recorded practically without interruptions. In history mode, users can easily navigate – either manually or automatically – through all recorded segments, and reconstruct the history thanks to very exact timestamps.



A segmented memory of 460 Msample makes it possible to record and analyze burst signals with up to 45 000 segments.

Power analysis: current and voltage in detail

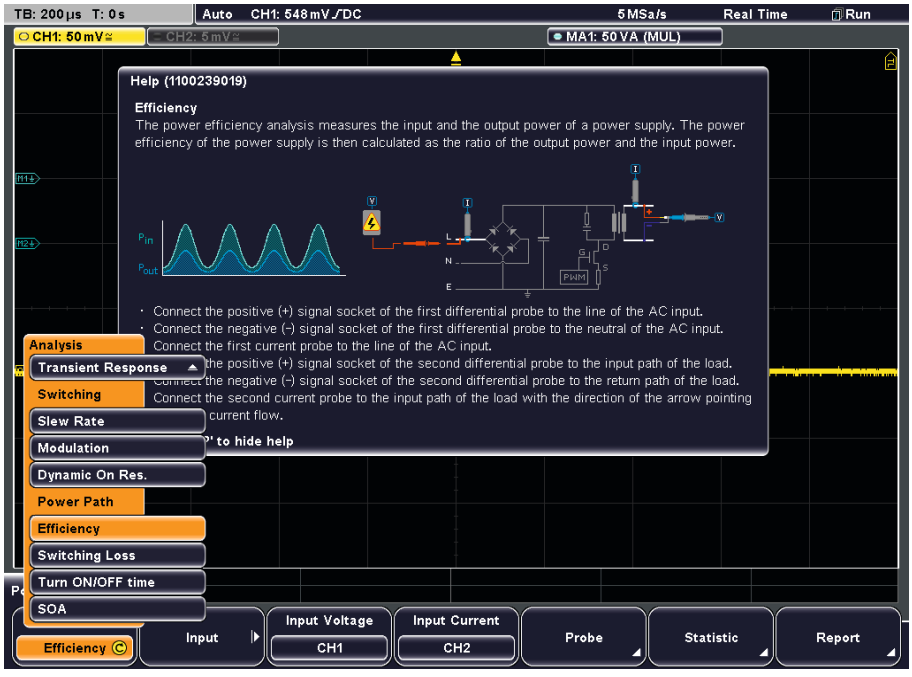
Switched-mode power supplies and power electronics can be found in many electronic devices, from consumer goods such as mobile phones to drive controls for industrial equipment. For characterizing power components, the R&S®RTM-K31 power analysis option provides automated measurement functions, guides the user through the test sequence and documents the measurement results.

Specialized measurement functions for characterizing power electronics

Analysis tools support verification and debugging during the development of current and voltage supply circuits. The R&S®RTM-K31 power analysis option facilitates the analysis of the turn on/turn off behavior, the internal transfer function of the overall circuit, the safe operating area (SOA), the output signal quality and any loss.

Measurement functions of the R&S®RTM-K31 option

Measurement	Measurement functions	
Input	current harmonics	EN 61000-3-2 class A, B, C, D
		MIL-STD-1399
		RTCA DO-160
	inrush current	
	power quality	
	power consumption	
Power converter control	modulation analysis	
	slew rate	
	dynamic on-resistance	
Power path	safe operating area (SOA mask editor)	
	turn on/turn off	
	switching loss	
	power efficiency	
Output	output ripple	
	transient response	
	output spectrum	


TB: 200 µs T: 0 s
Auto CH1: 548 mV ⎍ DC
5 MSa/s
Real Time
Run
CH1: 50 mV
CH2: 5 mV
MA1: 50 VA (MUL)
Help (1100239019)
Efficiency
The power efficiency analysis measures the input and the output power of a power supply. The power efficiency of the power supply is then calculated as the ratio of the output power and the input power.
Connect the positive (+) signal socket of the first differential probe to the line of the AC input.
Connect the negative (-) signal socket of the first differential probe to the neutral of the AC input.
Connect the first current probe to the line of the AC input.
Connect the positive (+) signal socket of the second differential probe to the input path of the load.
Connect the negative (-) signal socket of the second differential probe to the return path of the load.
Connect the second current probe to the input path of the load with the direction of the arrow pointing current flow.
' to hide help
Analysis
Transient Response
Switching
Slew Rate
Modulation
Dynamic On Res.
Power Path
Efficiency
Switching Loss
Turn ON/OFF time
SOA
Efficiency
Input
Input Voltage
CH1
Input Current
CH2
Probe
Statistic
Report

The online help facilitates quick and easy testing.

Graphical support for error-free operation

When users select a measurement function, graphics guide them through the test setup. Detailed illustrations show the correct contacting of probes and current probes. The oscilloscope configures itself automatically based on the selected measurement function and delivers quick results. For a detailed analysis or for documentation purposes, the measurement results are available in .csv file format.

Standards for limiting the harmonic current

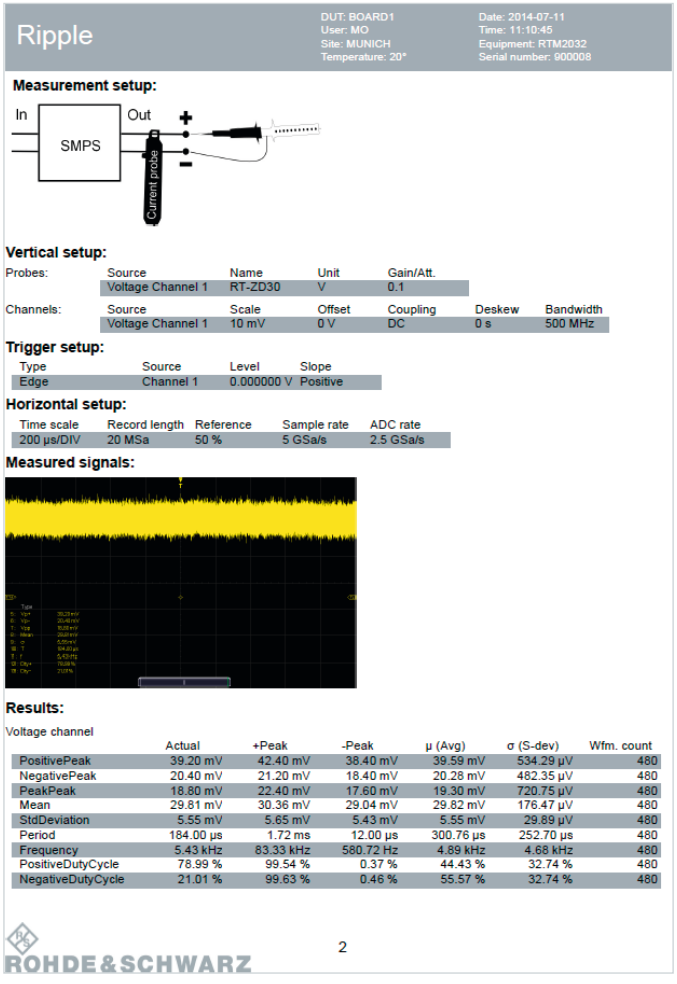
Depending on the application, different standards for limiting the harmonic current must be met when developing switched-mode power supplies. The R&S®RTM-K31 option supports the user during testing of all conventional standards: EN 61000-3-2 classes A, B, C, D, MIL-STD-1399 and RTCA DO-160.

Easy, clear documentation of power analysis

Each result can be added to the test report simply by pressing a button. The test report documents the current setup and configuration. The R&S®Oscilloscope Report Creator – available free of charge on the Rohde&Schwarz website – is used to generate a report. Users can define the level of detail for the report and customize the layout, for example, by adding a company logo. The output format is .pdf.

Extensive accessories for contacting and delay compensation

A wide range of passive and active probes permits measurements in common voltage and current ranges. The R&S®RT-ZF20 deskew fixture for power measurements can be used to time-synchronize the measurement signals from the current and voltage probes. The R&S®RTM-K31 power analysis option automatically deskews the current probe and voltage probe signals at the push of a button.



Ripple

DUT: BOARD1
User: MO
Site: MUNICH
Temperature: 20°

Date: 2014-07-11
Time: 11:10:45
Equipment: RTM2032
Serial number: 900008

Measurement setup:

Vertical setup:

Probes:	Source	Name	Unit	Gain/Att.
	Voltage Channel 1	RT-ZD30	V	0.1

Channels:	Source	Scale	Offset	Coupling	Deskew	Bandwidth
	Voltage Channel 1	10 mV	0 V	DC	0 s	500 MHz

Trigger setup:

Type	Source	Level	Slope
Edge	Channel 1	0.000000 V	Positive

Horizontal setup:

Time scale	Record length	Reference	Sample rate	ADC rate
200 µs/DIV	20 MSa	50 %	5 GSa/s	2.5 GSa/s

Measured signals:

Results:

Voltage channel

	Actual	+Peak	-Peak	µ (Avg)	σ (S-dev)	Wfm. count
PositivePeak	39.20 mV	42.40 mV	38.40 mV	39.59 mV	534.29 µV	480
NegativePeak	20.40 mV	21.20 mV	18.40 mV	20.28 mV	482.35 µV	480
PeakPeak	18.80 mV	22.40 mV	17.60 mV	19.30 mV	720.75 µV	480
Mean	29.81 mV	30.36 mV	29.04 mV	29.82 mV	176.47 µV	480
StdDeviation	5.55 mV	5.65 mV	5.43 mV	5.55 mV	29.89 µV	480
Period	184.00 µs	1.72 ms	12.00 µs	300.76 µs	252.70 µs	480
Frequency	5.43 kHz	83.33 kHz	580.72 Hz	4.89 kHz	4.68 kHz	480
PositiveDutyCycle	78.99 %	99.54 %	0.37 %	44.43 %	32.74 %	480
NegativeDutyCycle	21.01 %	99.63 %	0.46 %	55.57 %	32.74 %	480

ROHDE&SCHWARZ

2

Extensive result documentation.

Probes: excellent contacting

High-quality active and passive probes complete the R&S®RTM oscilloscopes. They measure with high accuracy, are reliable and easy to use.

Practical design: micro button for convenient instrument control. Diverse probe tips and ground cables are included as standard accessories.

The R&S®RTM probe family

Passive probes are suited for general measurements on low-frequency signals with less stringent accuracy requirements. The R&S®RTM comes with one R&S®RTM-ZP10 passive probe (500 MHz bandwidth) per oscilloscope channel. The R&S®RT-ZH10/-ZH11 passive high-voltage probes are used for voltages over 400 V.

Active probes are used whenever the load on the device under test must be low, or when the measurement signal contains high-frequency components that must not be distorted. Even signals in the kilohertz range can contain high-frequency components of well over 100 MHz on their edges. For these applications, Rohde&Schwarz has a family of high-quality active probes. Due to their bandwidth, the R&S®RT-ZS10E and R&S®RT-ZS10 single-ended probes are suitable for R&S®RTM oscilloscopes. The two differ only in the functions they provide. The R&S®RT-ZS10E offers solid basic functionality and an attractive price/performance ratio, while the R&S®RT-ZS10 has more extensive accessories as well as some useful extras such as an integrated voltmeter and a micro button on the probe tip for instrument control.

The R&S®RT-ZD10 probe is ideal for differential measurements; it also integrates a voltmeter and a micro button for instrument control. For differential high-voltage measurements (up to 100 MHz), the R&S®RT-ZD01 probe is the best choice.

Two current probes are available for current measurements, the R&S®RT-ZC10 up to 150 A (RMS) and the R&S®RT-ZC20 up to 30 A (RMS).

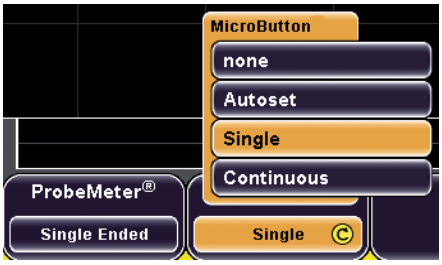
High signal fidelity due to excellent specifications

Besides bandwidth, the crucial parameters for probes are input impedance and dynamic range. With their high input impedance, the active probes put only a minimal load on a signal source. The very large vertical dynamic range prevents signal distortion especially at high frequencies. Measurements are not interrupted for compensation processes because the probes' offset and gain errors are nearly independent of temperature (e.g. zero drift < 90 µV/°C for the R&S®RT-ZS10/-Z10E probes).

▷ For more information, see the product brochure: Digital oscilloscopes from Rohde&Schwarz, Probes and accessories (PD 3606.8866.12).

Micro button for convenient instrument control

The situation is all too familiar. The user has carefully positioned the probes on the device under test and now wants to start the measurements – but does not have a hand free. The micro button on the active probes from Rohde&Schwarz eliminates this problem. The micro button is situated on the probe tip, and different functions such as Run/Stop, Autoset or Adjust Offset can be assigned to this button.



Menu for configuring the micro button.

R&S®ProbeMeter: high DC measurement accuracy regardless of instrument settings.

R&S®ProbeMeter: integrated voltmeter for precise DC measurements

Is the supply voltage correct? Is DC voltage superimposed? These questions from everyday practice are answered by the active probes' integrated voltmeter (R&S®ProbeMeter). It always shows the DC value of a measurement signal with the full dynamic range – regardless of the other instrument settings. The following advantages simplify everyday measurement tasks:

- Fast verification of supply voltages and signal levels without changing the oscilloscope settings
- Automatic compensation of the DC component for AC measurements with optimal dynamic range
- DC value of a measurement signal as a reference for trigger level setting
- Significantly higher DC measurement accuracy compared to a traditional oscilloscope channel
- DC common mode and differential voltage on the R&S®RT-ZD10

R&S®RT-ZC20 current probe (100 MHz, 30 A (RMS)).

R&S®RT-ZD01 high-voltage differential probe (100 MHz, 1 kV (RMS)).

Rohde&Schwarz active probes.

R&S®RT-ZD10/20.

R&S®RT-ZS10.

Probe	Bandwidth	Attenuation factor	Input impedance	Input capacitance	Dynamic range	Extras
Passive probes						
R&S®RTM-ZP10	500 MHz	10:1	10 MΩ	≈ 10 pF	400 V (RMS)	
High-voltage probes						
R&S®RT-ZH10	400 MHz	100:1	50 MΩ	7.5 pF	1 kV (RMS)	
R&S®RT-ZH11	400 MHz	1000:1				
Active probes						
R&S®RT-ZS10E	1.0 GHz	10:1	1 MΩ	0.8 pF	±8 V	
R&S®RT-ZS10	1.0 GHz					R&S®ProbeMeter and micro button for instrument control
Differential probes						
R&S®RT-ZD01	100 MHz	100:1/1000:1	8 MΩ	3.5 pF	±140 V/±1400 V	
R&S®RT-ZD10	1.0 GHz	10:1	1 MΩ	0.6 pF	±5 V	R&S®ProbeMeter and micro button for instrument control
		100:1		1.3 pF	70 V DC, 46 V AC (peak)	

Probe	Bandwidth	Max. current (RMS/peak)	Rise time	Sensitivity error	Max. input voltage	Extras
Current probes						
R&S®RT-ZC10	10 MHz	150 A/±300 A	35 ns	±1 % up to 150 A (RMS)	600 V (CAT II), 300 V (CAT III)	external power supply required, e.g. R&S®RT-ZA13
R&S®RT-ZC20	100 MHz	30 A/±50 A	3.5 ns	±1 % up to 30 A (RMS)	300 V (CAT I)	

Accessories: for rack installation and transport

Safely stowed away

Thanks to an extensive selection of storage and transportation accessories, the R&S®RTM is always fully protected and easy to transport. The R&S®RTM-Z3 soft carrying bag provides ample space for the oscilloscope, probes and cables.

Easy integration

The R&S®ZZA-RTM rackmount kit permits easy installation in only four height units, e.g. for testing directly on the production line.

Accessories	
Front cover	R&S®RTM-Z1
Soft carrying bag	R&S®RTM-Z3
Transit case	R&S®RTM-Z4
Rackmount kit	R&S®ZZA-RTM

Universal: numerous functions for many applications

A bench oscilloscope should be fast and easy to use and deliver reliable results. It should handle diverse applications from time analysis to FFT, from logic analysis to protocol analysis. This is where the R&S®RTM excels.

R&S®RTM oscilloscopes: suitable for all tests and measurements.

Electronics development

Oscilloscopes are used for a variety of tasks in the development of embedded designs, ranging from putting hardware into operation to QM acceptance testing, certification and servicing. All these tasks require an oscilloscope with intelligent measurement functions that can deliver precise results based on intuitive operation. The R&S®RTM oscilloscopes were developed to perform these tasks and fulfill the related requirements. For example, the QuickMeas function yields first results only a few seconds after power-on. Logic and protocol analysis enable more in-depth signal analysis for debugging embedded designs.

Production

Quality testing of electrical signals should be based on a tolerance test with pass/fail results. The mask test is the tool of choice for this application. The tester only needs to connect the device under test to the oscilloscope and record the measurement result. Since the mask test is integrated into the R&S®RTM, no additional costs are incurred.

Education

To successfully teach students the theoretical and practical aspects of working with oscilloscopes, an ease-of-use concept combined with state-of-the-art technology is highly beneficial. The R&S®RTM oscilloscopes are perfect for everyday use at universities and colleges due to the diverse manual settings and rugged design. Operating errors can be quickly corrected using the undo/redo key. Data and programming interfaces are already included, for instance for seamless MATLAB® integration. In addition, a complete portfolio of software and hardware options and probes is available for measuring signals in research labs.

Service

Service technicians must rapidly identify faulty modules. The R&S®RTM oscilloscopes support them with comprehensive measurement functions and straightforward operation. Their lightweight, compact design facilitates work at customer sites, for instance in a switching cabinet.

Specifications in brief

Specifications in brief		
Vertical system		
Number of channels	R&S®RTM2032/R&S®RTM2052	2
	R&S®RTM2034/R&S®RTM2054	4
Bandwidth (–3 dB) at 50 Ω	R&S®RTM2032/R&S®RTM2034	350 MHz
	R&S®RTM2052/R&S®RTM2054	500 MHz
Rise time (calculated)	R&S®RTM2032/R&S®RTM2034	1 ns
	R&S®RTM2052/R&S®RTM2054	700 ps
Input impedance		50 Ω ± 1.5 %, 1 MΩ ± 1 % at 12 pF ± 1 pF
Input sensitivity	max. bandwidth in all ranges	50 Ω: 1 mV/div to 1 V/div, 1 MΩ: 1 mV/div to 10 V/div
DC gain accuracy	offset and position = 0 maximum operating temperature change of ±5 °C after self-alignment	
	input sensitivity	> 5 mV/div ±1.5 %
	input sensitivity	≤ 5 mV/div ±2 %
Resolution		8 bit, up to 16 bit with high resolution decimation
Acquisition system		
Maximum realtime sampling rate		2.5 Gsample/s; 5 Gsample/s, interleaved
Acquisition memory		10 Msample; 20 Msample, interleaved; with R&S®RTM-K15 option: 460 Msample segmented memory
Decimation algorithms	combination of decimation mode and waveform arithmetics possible	sample, peak detect, high resolution
Waveform arithmetics		off, envelope, average, smooth, filter
Horizontal system		
Timebase range		1 ns/div to 50 s/div
Timebase accuracy		±3.5 ppm
Channel deskew		±100 ns
Trigger system		
Trigger types		edge, width, video (PAL, SECAM, PAL-M, SDTV, HDTV), pattern, runt, slew rate, B trigger; optional: I²C, SPI, UART/RS-232/RS-422/RS-485, CAN/LIN, MIL-STD-1553, ARINC 429
Trigger level		±10 div from center of screen
Analysis and measurement functions		
QuickMeas	at the push of a button, internal measurement values are written directly onto the waveform and updated continuously	peak-to-peak voltage, pos. peak, neg. peak, rise time, fall time, mean value, RMS value, time, frequency
Automated measurements		31 measurement functions
Cursor measurements		14 measurement functions
Waveform mathematics		20 measurement functions
MSO option		
Digital channels		16 (2 logic probes)
Input impedance		100 kΩ || 4 pF
Sampling rate	2 logic probes connected, 1 logic probe connected	2.5 Gsample/s per channel, 5 Gsample/s per channel
Acquisition memory	2 logic probes connected, 1 logic probe connected	10 Msample per channel, 20 Msample per channel
General data		
Dimensions	W × H × D	403 mm × 189 mm × 142 mm (15.87 in × 7.44 in × 5.59 in)
Weight		4.1 kg (9.04 lb)
Screen		8.4" XGA TFT color display (1024 × 768 pixel)
Interfaces		2 × USB host, USB device, LAN, GPIB (optional), DVI-D for external monitor

For data sheet, see PD 3606.8066.22 and www.rohde-schwarz.com.

Ordering information

Designation	Type	Order No
Base unit (including standard accessories: per channel: 500 MHz passive probe (10:1), compact manual, CD-ROM (with operating and service manual), power cord)		
Digital Oscilloscope		
Digital Oscilloscope, 350 MHz, 2 channels	R&S®RTM2032	5710.0999.32
Digital Oscilloscope, 350 MHz, 4 channels	R&S®RTM2034	5710.0999.34
Digital Oscilloscope, 500 MHz, 2 channels	R&S®RTM2052	5710.0999.52
Digital Oscilloscope, 500 MHz, 4 channels	R&S®RTM2054	5710.0999.54
Hardware options		
Mixed Signal Option, 400 MHz	R&S®RTM-B1	5710.0901.02
GPIB Interface	R&S®RTM-B10	1305.0014.02
Bandwidth Upgrade from 350 MHz to 500 MHz	R&S®RTM-B200	5710.0918.02
Software options		
I^2C/SPI Serial Triggering and Decoding	R&S®RTM-K1	5710.1443.02
UART/RS-232/RS-422/RS-485 Serial Triggering and Decoding	R&S®RTM-K2	5710.1450.02
CAN/LIN Serial Triggering and Decoding	R&S®RTM-K3	5710.1466.02
I^2S/LJ/RJ/TDM Serial Triggering and Decoding	R&S®RTM-K5	5710.0882.02
MIL-STD-1553 Serial Triggering and Decoding	R&S®RTM-K6	1317.6835.02
ARINC 429 Serial Triggering and Decoding	R&S®RTM-K7	1317.6841.02
History and Segmented Memory	R&S®RTM-K15	5710.0899.02
Power Analysis	R&S®RTM-K31	1317.5745.02
Probes		
500 MHz, passive, 10:1, 10 MΩ || 9.5 pF, max. 400 V	R&S®RTM-ZP10	1409.7708.02
400 MHz, passive, high-voltage, 100:1, 50 MΩ || 7.5 pF, 1 kV (RMS)	R&S®RT-ZH10	1409.7720.02
400 MHz, passive, high-voltage, 1000:1, 50 MΩ || 7.5 pF, 1 kV (RMS)	R&S®RT-ZH11	1409.7737.02
1.0 GHz, active, 1 MΩ || 0.8 pF	R&S®RT-ZS10E	1418.7007.02
1.0 GHz, active, 1 MΩ || 0.8 pF, R&S®ProbeMeter, micro button	R&S®RT-ZS10	1410.4080.02
100 MHz, high-voltage, active, differential, 8 MΩ || 3.5 pF, 1 kV (RMS) (CAT III)	R&S®RT-ZD01	1422.0703.02
1.0 GHz, active, differential, 1 MΩ || 0.6 pF, R&S®ProbeMeter, micro button, including 10:1 external attenuator, 1.3 pF, 70 V DC, 46 V AC (peak)	R&S®RT-ZD10	1410.4715.02
10 MHz, current, AC/DC, 0.01 V/A, 150 A (RMS)	R&S®RT-ZC10	1409.7750.02
100 MHz, current, AC/DC, 0.1 V/A, 30 A (RMS)	R&S®RT-ZC20	1409.7766.02
Probe accessories		
Accessory Set for R&S®RTM-ZP10 Passive Probe	R&S®RT-ZA1	1409.7566.02
Spare Accessory Set for R&S®RT-ZS10/R&S®RT-ZS10E	R&S®RT-ZA2	1416.0405.02
Pin Set for R&S®RT-ZS10/R&S®RT-ZS10E	R&S®RT-ZA3	1416.0411.02
Mini Clips	R&S®RT-ZA4	1416.0428.02
Micro Clips	R&S®RT-ZA5	1416.0434.02
Lead Set	R&S®RT-ZA6	1416.0440.02
Pin Set for R&S®RT-ZD20	R&S®RT-ZA7	1417.0609.02
Probe Power Supply	R&S®RT-ZA13	1409.7789.02
External Attenuator, 10:1, 2.0 GHz, 70 V DC, 46 V AC (peak)	R&S®RT-ZA15	1410.4744.02
Deskew Fixture for power measurements	R&S®RT-ZF20	1800.0004.02
Accessories		
Front Cover	R&S®RTM-Z1	1305.0272.02
Soft Carrying Bag for R&S®RTM oscilloscopes and accessories	R&S®RTM-Z3	1305.0289.02
Transit Case	R&S®RTM-Z4	1317.4210.02
Rackmount Kit	R&S®ZZA-RTM	1304.8292.02

Service options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde&Schwarz sales representative.
Extended Warranty, two years	R&S®WE2	
Extended Warranty, three years	R&S®WE3	
Extended Warranty, four years	R&S®WE4	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Calibration Coverage, three years	R&S®CW3	
Extended Warranty with Calibration Coverage, four years	R&S®CW4	

Your local Rohde&Schwarz expert will help you determine the optimum solution for your requirements.
To find your nearest Rohde&Schwarz representative, visit
www.sales.rohde-schwarz.com

Service that adds value

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

About Rohde&Schwarz

The Rohde&Schwarz electronics group is a leading supplier of solutions in the fields of test and measurement, broadcasting, secure communications, and radiomonitoring and radiolocation. Founded more than 80 years ago, this independent global company has an extensive sales network and is present in more than 70 countries.
The company is headquartered in Munich, Germany.

Sustainable product design

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

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R&S®RTM Digital Oscilloscope

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